

Isis

Elegance, Beauty, and Comfort Under
Sail



S.M. Doherty
K.A. Johnson
M.A.
Sammataro
S.G. Weber



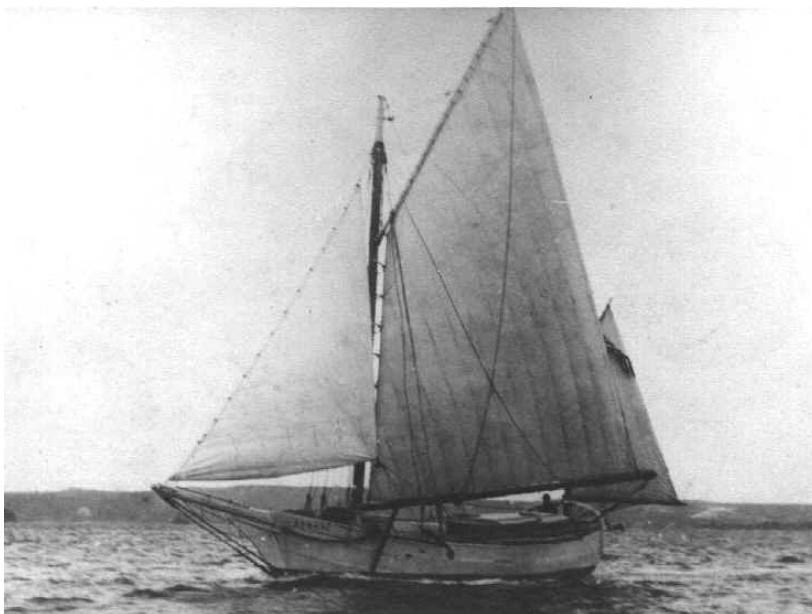
[Mission Statement]

The *Isis* is a trans-oceanic sloop characterized by classic styling, while still utilizing modern technology. She is designed for the discerning owner who desires a high-performance yacht equally capable of providing a comfortable day sail with friends and family, impressing boat enthusiasts and business partners with its smooth lines and luxurious accommodations, or enduring a trans-Atlantic voyage for a vacation getaway.



Parametric Analysis

Looked at 57 vessels
between 57' and 112'



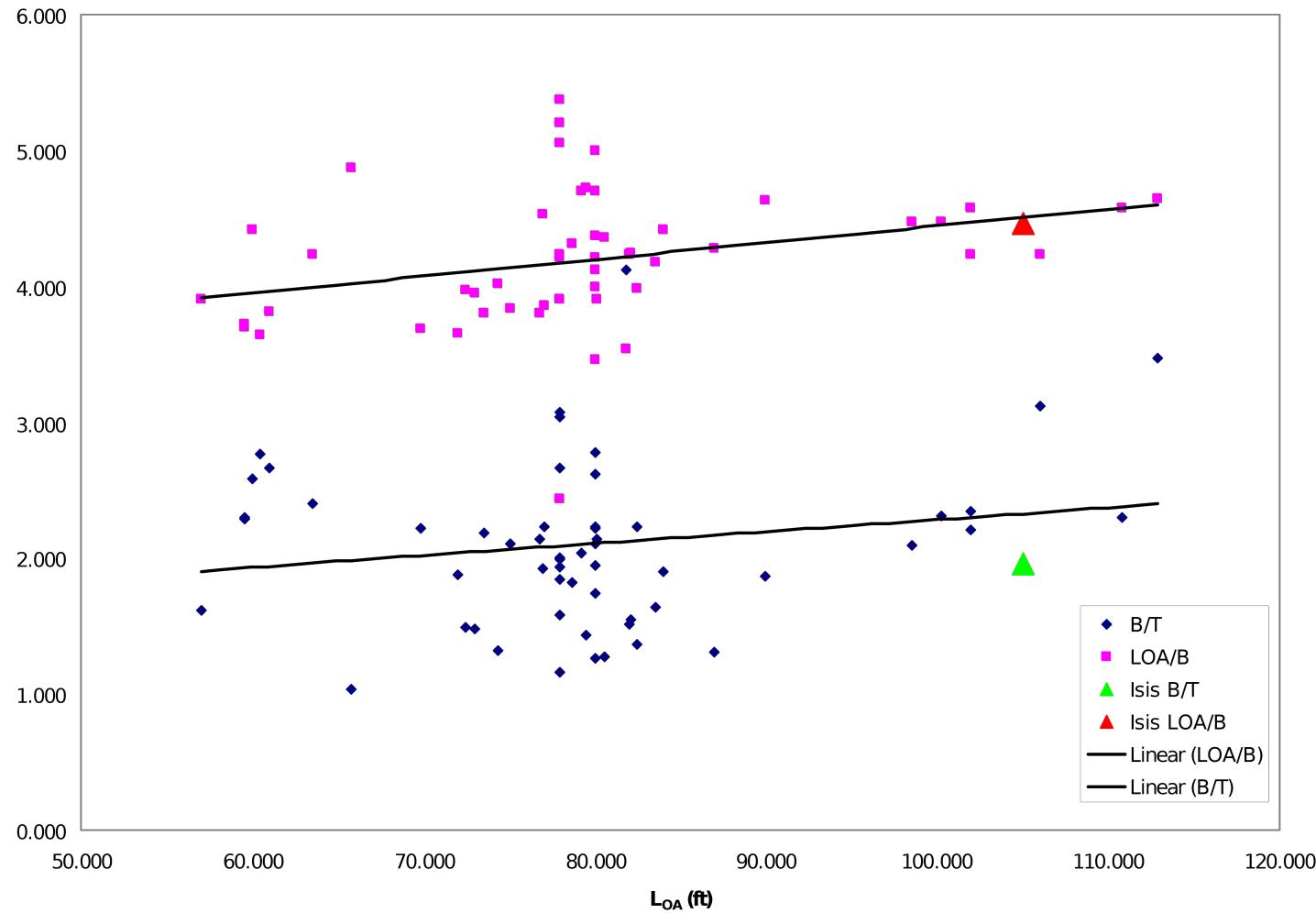
‘Spray’



‘Sayonara’



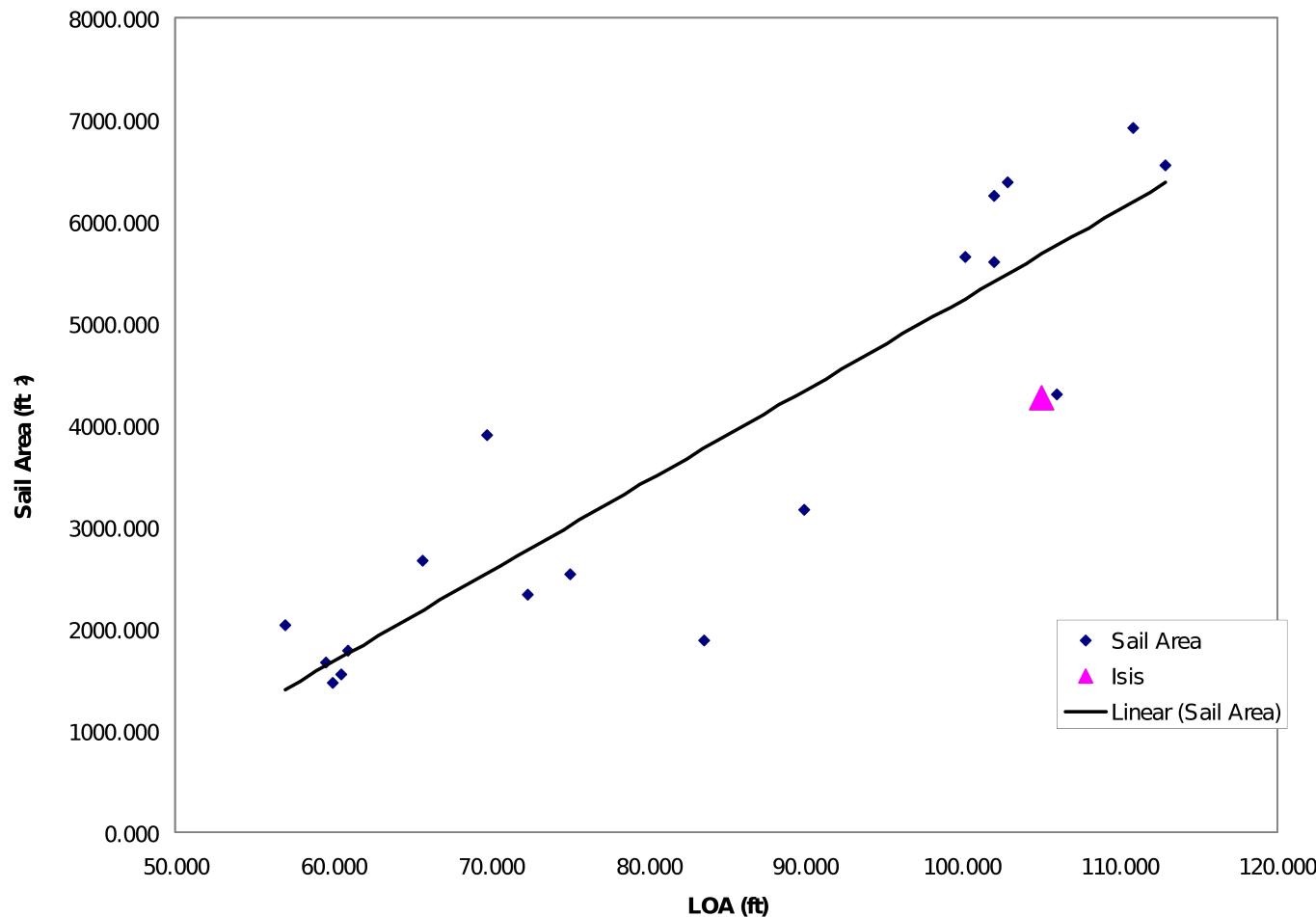
Parametric Analysis





Parametric Analysis

Sail Area vs. Length Overall



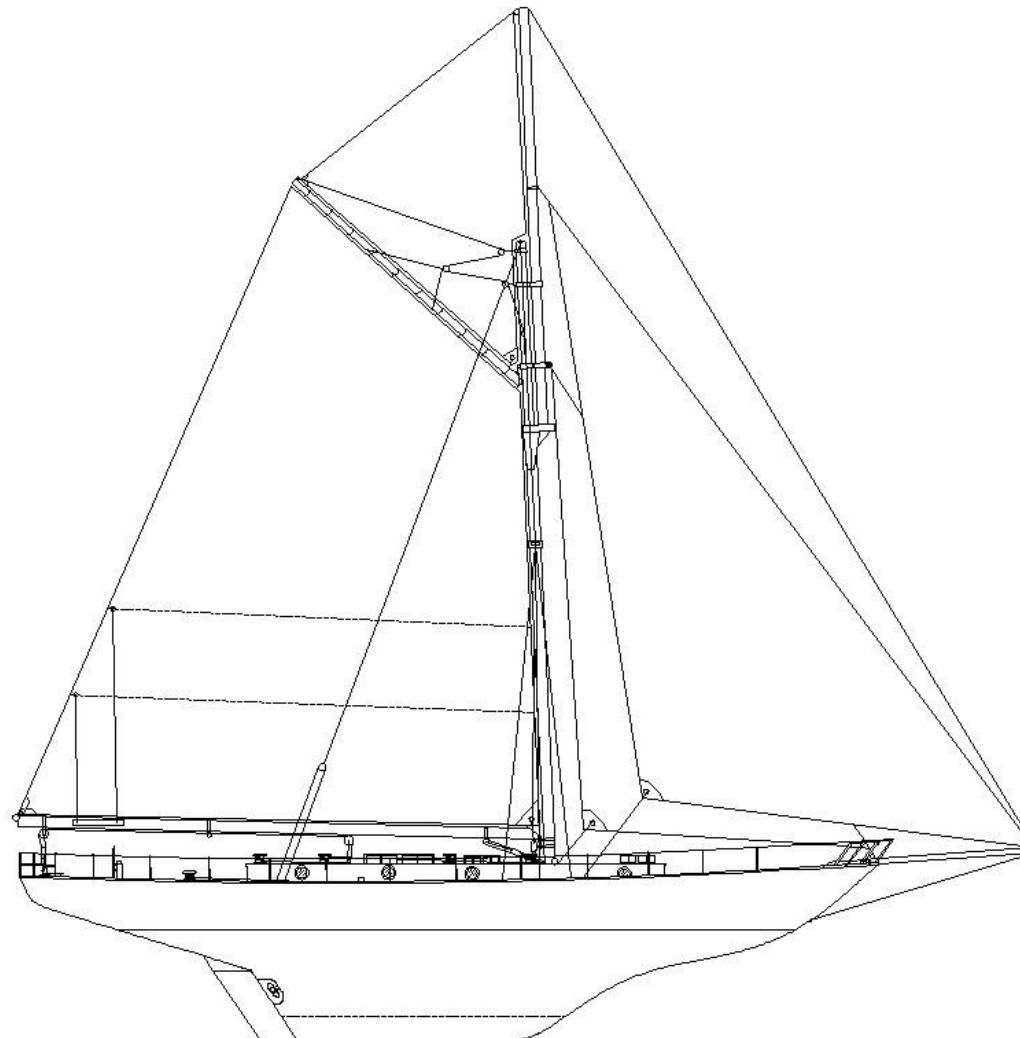


[*Isis* Characteristics]

- Loa - 105 ft.
- Length of hull - 88 ft.
- Lwl - 70.3 ft.
- B - 23.5 ft.
- T - 12 ft.
- D - 18.7 ft
- Displacement - 95.7 LTSW
- Mast height - 95 ft. from the DWL
- Rig type - Gaff rig sloop



Outboard Profile



ISIS OUTBOARD
PROFILE

DESIGN TEAM

1/C WEBER	
1/C JOHNSON	
1/C SAMMATARO	
1/C DOHERTY	
DRAWING 1 OF 1	DATE: 27 APR 05
REVISION: 6	SCALE: 1
COMMENTS:	



Velocity Prediction Program

- PCSAIL2.5 - Freeware, University of Michigan
- Enter hull particulars and sail characteristics
- Velocity prediction for winds 6, 9, 12, 16, 20 knots
- Wind angles from 38 to 178 degrees (various increments)



Velocity Prediction Program

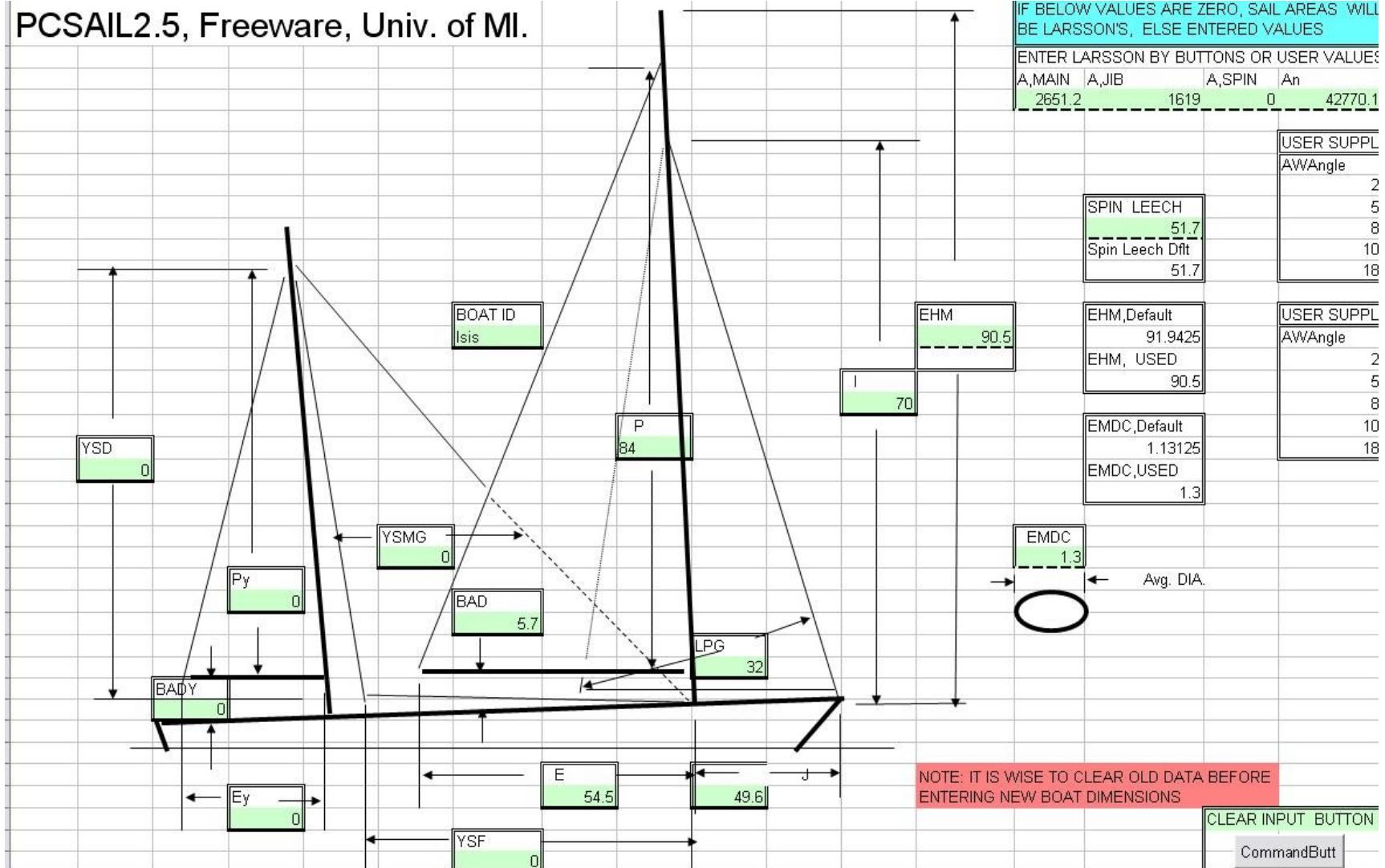
PCSAIL2.5, Freeware, U of MI

ENTER BOAT ID	Isis	IS THERE A CENTER BOARD ?	"YES/NO"	IF BOTH CB & DB THEN ZERO PREVENTS											
		No	No	VPP RUN, ELSE 1, OK											
				1											
				NOTE: MUST ENTER RUDDER DIMENSION											
<p>FIXED KEEL, ALSO SEE BELOW FOR CENTERBOARD INPUT</p>															
<p>water line</p>															
<p>root Cord 4</p>															
<p>Span 8 Dft 1.5</p>															
<p>tip cord 1</p>															
<p>root cord 41.2</p>															
<p>tipcord 20.7</p>															
<p>NO BOARD TRUE</p>															
<p>Dbulb if CB 0</p>															
<p>Lbulb if CB 0</p>															
<p>Tc 5.2</p>															
<p>NOCB,NODB TRUE</p>															
<p>Tmaxboard 5.2</p>															
<p>waterline Beam, Bwl 21.12</p>															
<p>water line Length, Lwl 70.29</p>															
<p>Tmin 12 Tmax 12 TO SAVE OLD DATA EN</p>															
<p>AND RE ENTER 1</p>															
<p>REVIEW INPUT BY CHECKING THAT NEW DATA IS REALLY NEW IF SO INTENDED, AND THAT DIMENSION-LESS RATIOS ARE "GOOD PRACTICE"</p>															
SAVED	39.25	30.78	10.239	10.89	3.59	5.816	1.789	13.606	9.265	1.85	1.85	3.5	0	0	1.32
DIMENSIONS	Loa	Lwl	Bwl	B	Favg	Tmaxfix	Tc	krtcrd	ktpcrd	Rudrtcrd	Rudtpcrd	Rudspn	Lb	Db	Dft
NEW	88.89	70.29	21.12	23.45	5.2	12	5.2	41.2	20.7	4	1	8	0	0	1.5
<p>COMPATABILITY OF DIMENSIONS WITH GOOD PRACTICE AND DELFT S, TRUE OR FALSE</p>															
Lwl/Bwl	Bwl/Tc	Lwl/DSPcf ^{0.52 < Cp < 0.6}	Lcbfpp/Lwl ^{0.6 < Cm < 0}	Favg/Lwl	CREW-Mvbl	?ALLOK?	SAVED	1.789	0	0	0	0	0	0	CLEAR INPUT
TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	DIMENSNS	Tmincb	Minsweep	CBcrd	CBspn	DBcrd	DBspn	Command	
NEW							NEW	5.2	20	0	0	0	0		



Velocity Prediction Program

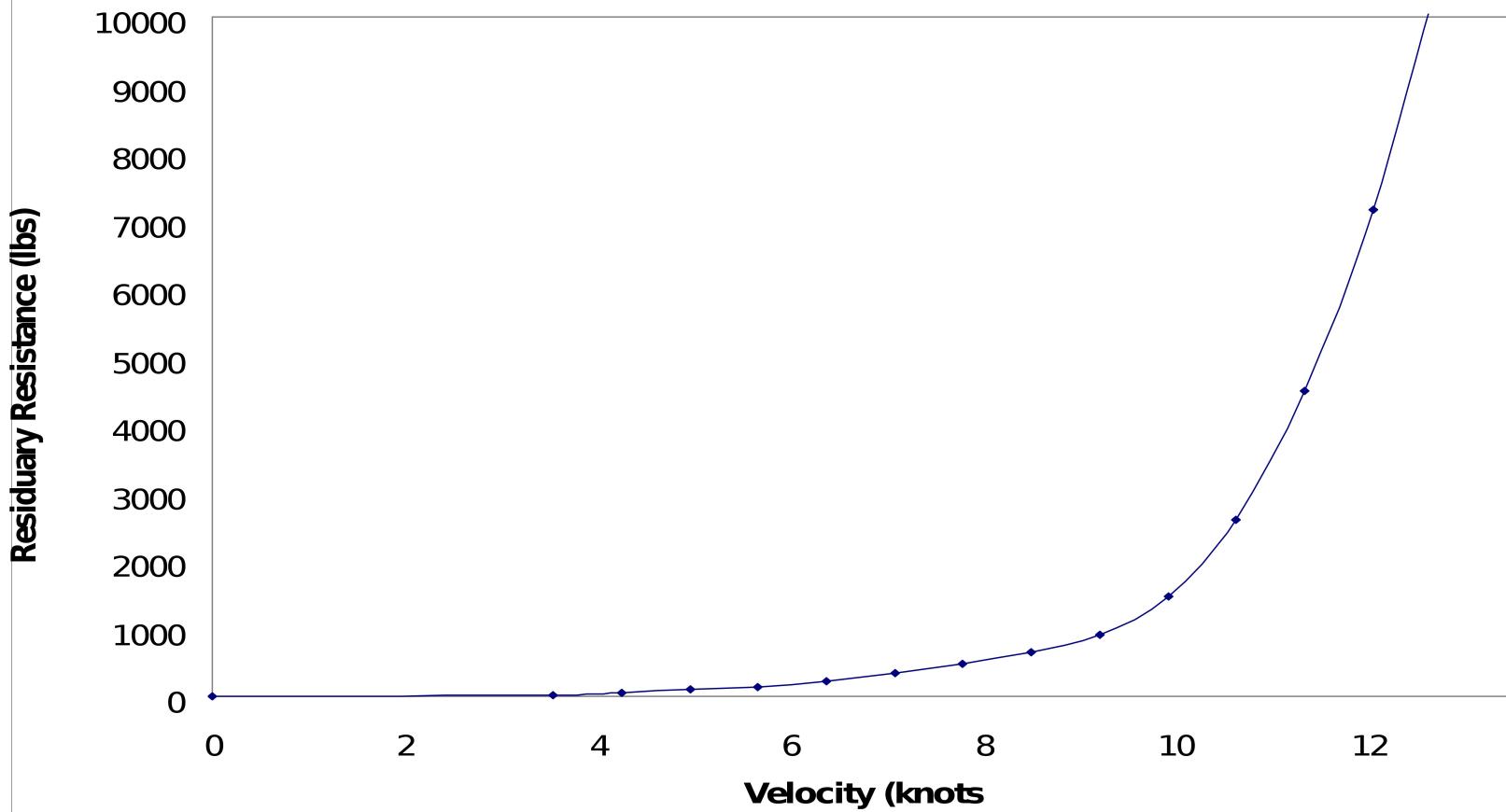
PCSAIL2.5, Freeware, Univ. of MI.





Velocity Prediction Program

Residuary Resistance Plot for Isis





Velocity Prediction Program

Motoring speed – approx. 8.5 knots

Froude = 0.301

R_r = 649.6 lbs (VPP)

R_{prop} = 35.5 lbs (VPP, 18" dia., feathering)

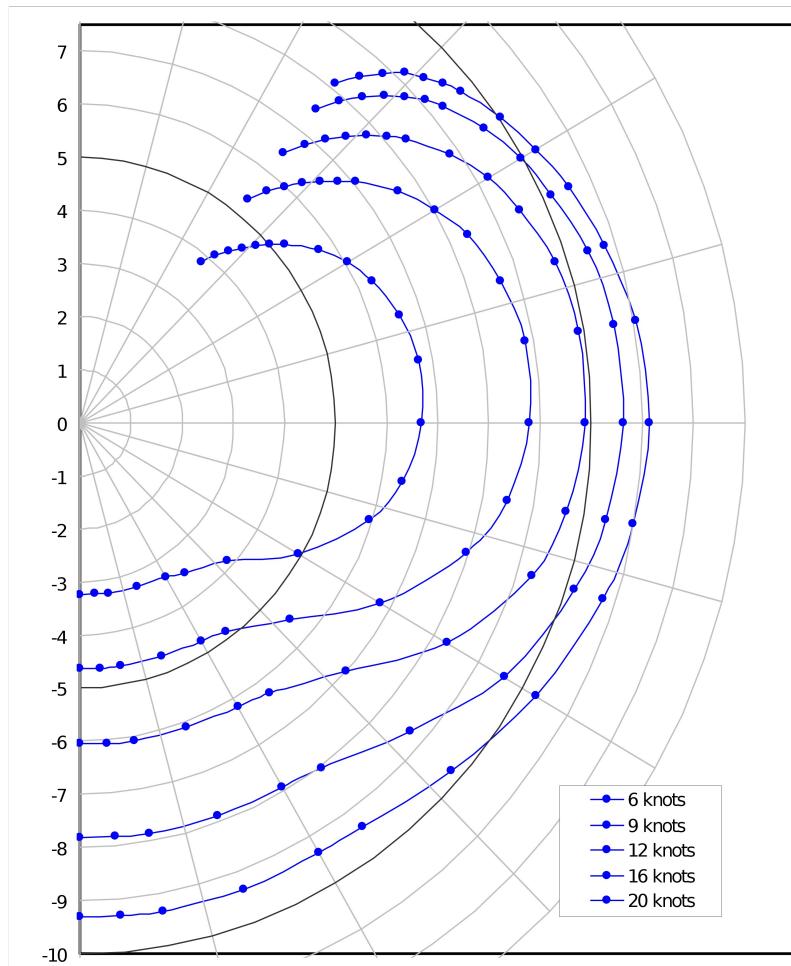
$R_{friction}$ = 928.3 lbs (VPP)

R_{Total} = 1613.4 lbs

EHP = **42.1**



Velocity Prediction



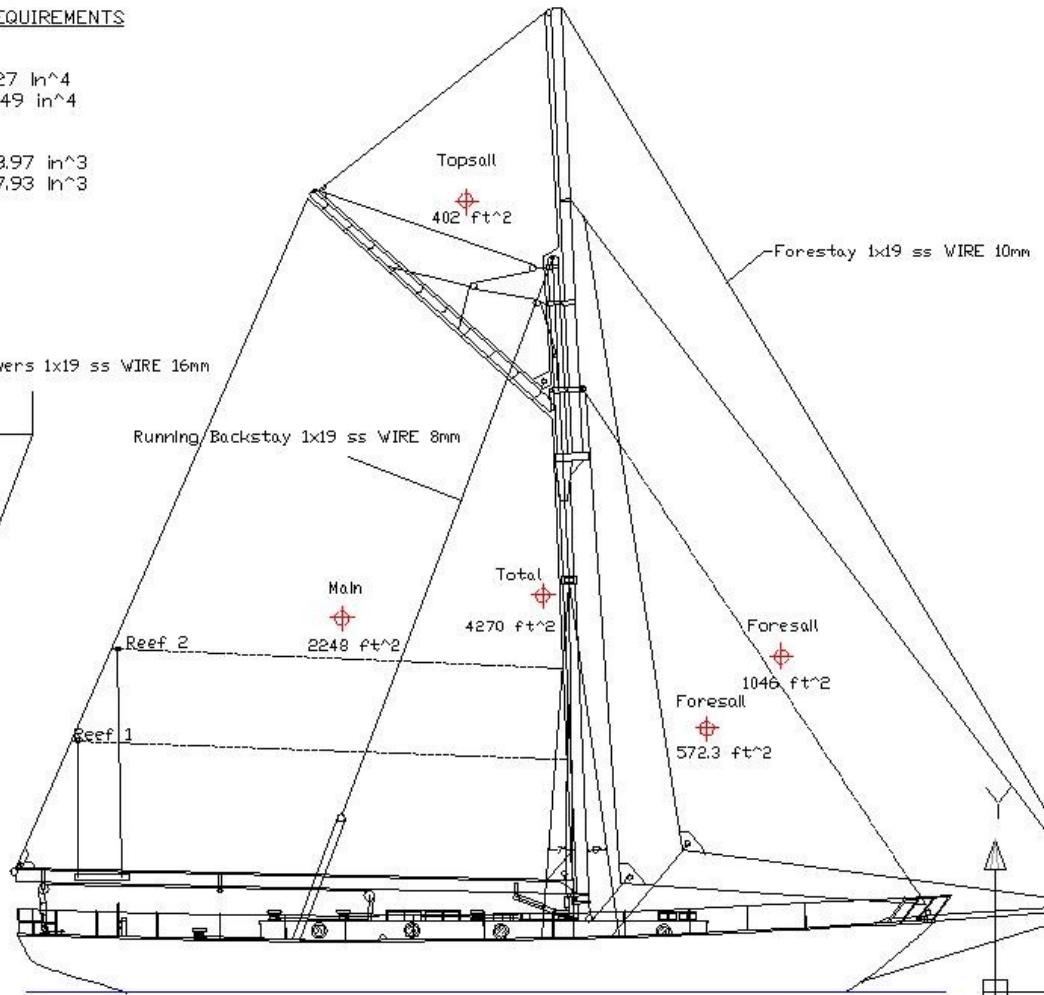
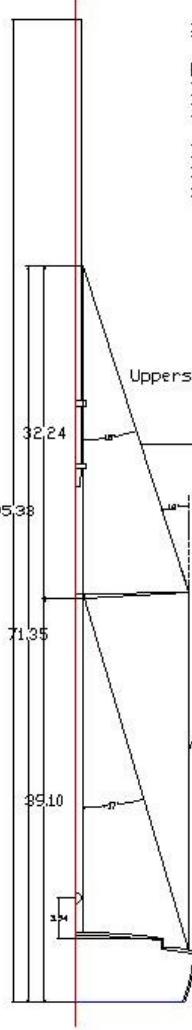
For Wind Velocity of 12 knots:

- Velocity upwind (47 deg) = 7.8 knots
- Beam reach (90 deg) = 9.9 knots
- DDW (180 deg) = 6.0 knots

- MAIN SAIL = 2248.2 sq. ft
- TOPSAIL = 403.0 sq. ft
- JIB = 1046.7 sq. ft
- STAYSAIL = 572.3 sq. ft
- TOTAL = 4270.2 sq. ft



Rig Design



ISIS RIG DESIGN

DESIGN TEAM	
I/C WEBER	
I/C JOHNSON	
I/C SAMMATARI	
I/C DOHERTY	
DRAWING 1 OF 1	DATE: 27 APR 05
REVISION 4	SCALE:
COMMENTS:	



[Rig Design]

- Assumptions (Larsson's)
 - 60% mainsail reef
 - no foresail
 - 30 deg. righting moment
- Trade-offs
 - Fewer spreaders to retain classic look
 - Thicker shrouds and stays
- Problems
 - Gaff?
 - Topmast?
- Weird but true
 - Carbon fiber spars (minus bowsprit)
 - Topmast for looks



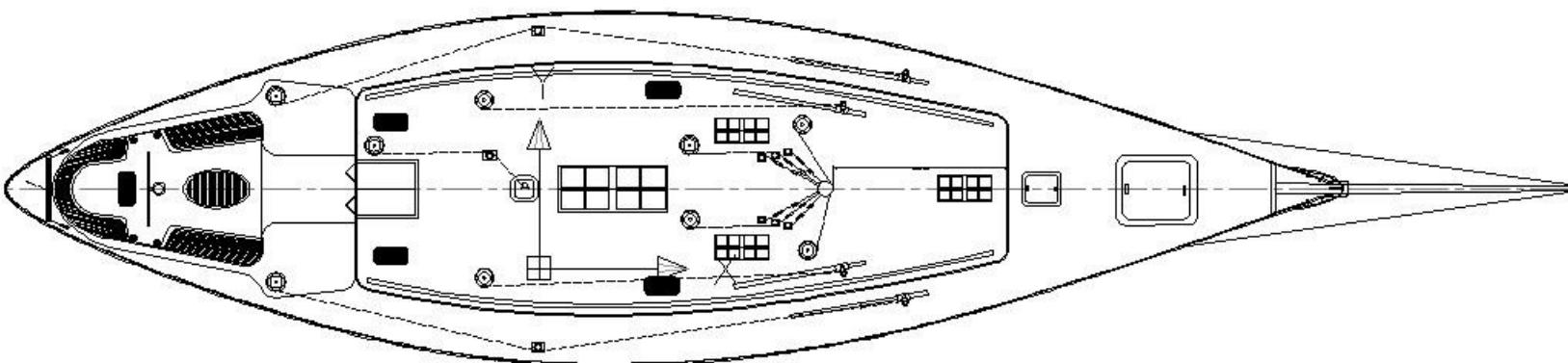
[Rig Design]

- Main Mast
 - Diameter = 14 in.
 - Wall Thickness = 0.51 in
- Top Mast
 - Diameter = 10 in.
 - Wall Thickness = 0.34 in
- Gaff
 - Diameter = 8.25 in.
 - Wall Thickness = 0.23 in
- Boom
 - Diameter = 11.5 in
 - Wall Thickness = 0.45 in

Carbon Fiber



Deck Layout



ISIS DECK LAYOUT

DESIGN TEAM

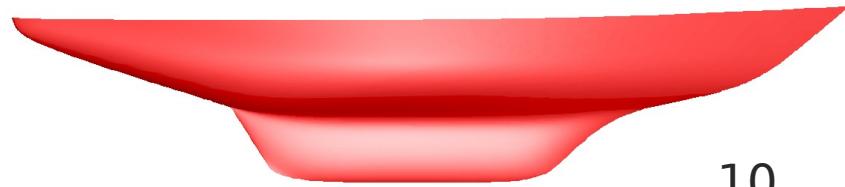
1/C WEBER	
1/C JOHNSON	
1/C SAMMATARO	
1/C DOHERTY	
DRAWING: 1 OF 1	DATE: 27 APR 05
REVISION: 4	SCALE:

COMMENTS:

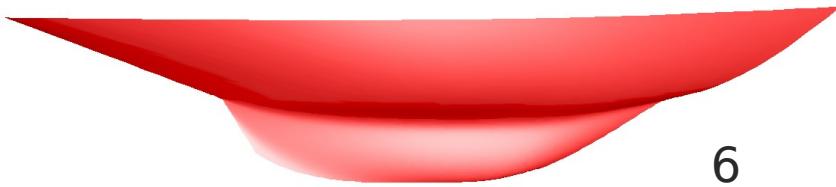
[Hull Progression]



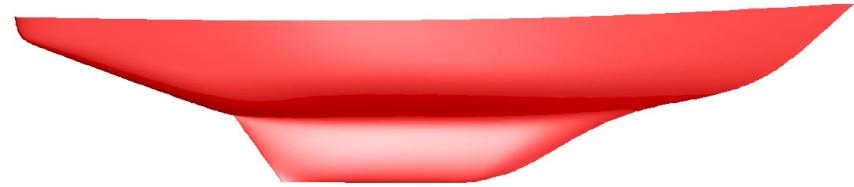
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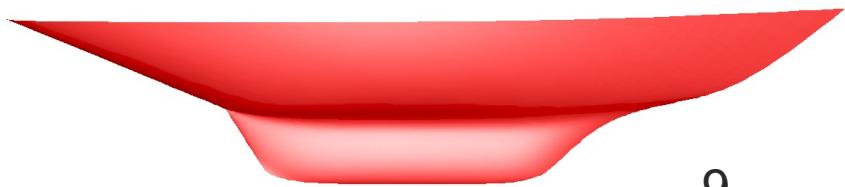
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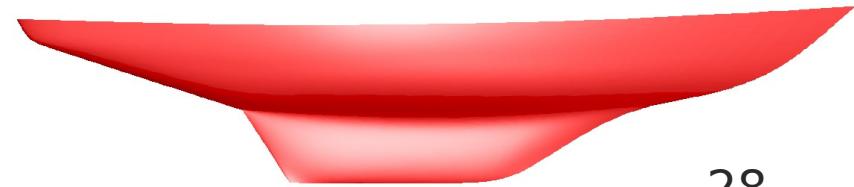
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14



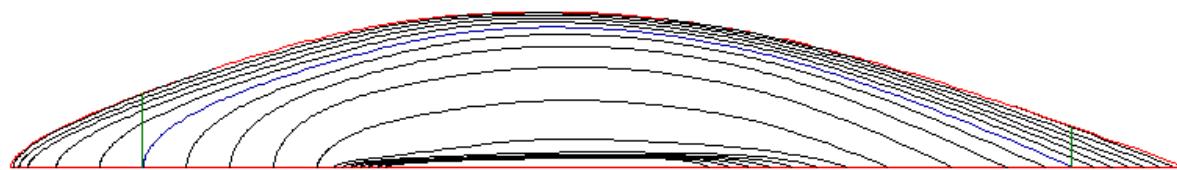
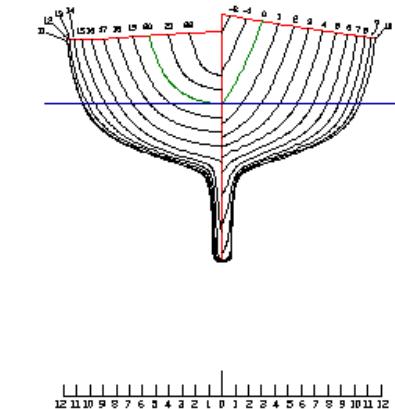
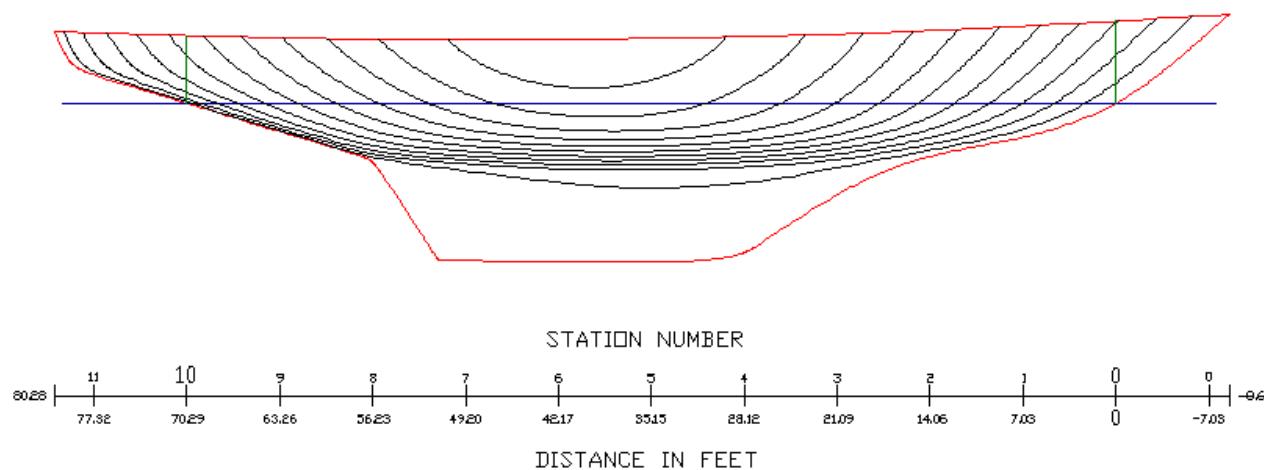
9



28



Hull Lines - revision 40



ISIS LINES PLAN	
DESIGN TEAM	
1/C WEBER	
1/C JOHNSON	
1/C SAMMATARO	
1/C DOHERTY	
DRAWING 1 OF 1	DATE: 26 APR 05
REVISION: 14	SCALE:
COMMENTS:	



Foil Design

Isis incorporates a full keel with an attached rudder.

The keel is a NACA 63-007 foil.

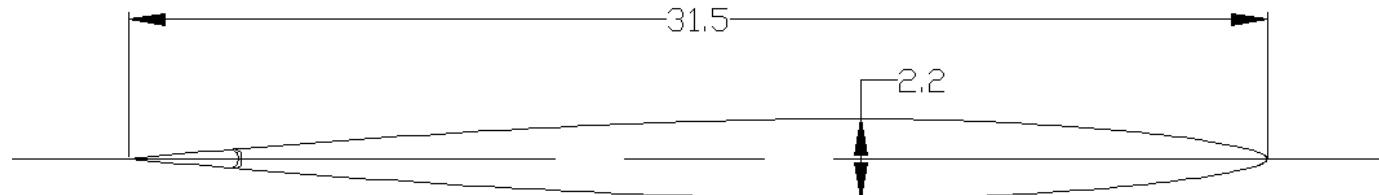
Aspect Ratio: 0.22

Rudder Area: 31 ft²

Sweep Angle: 42 degrees

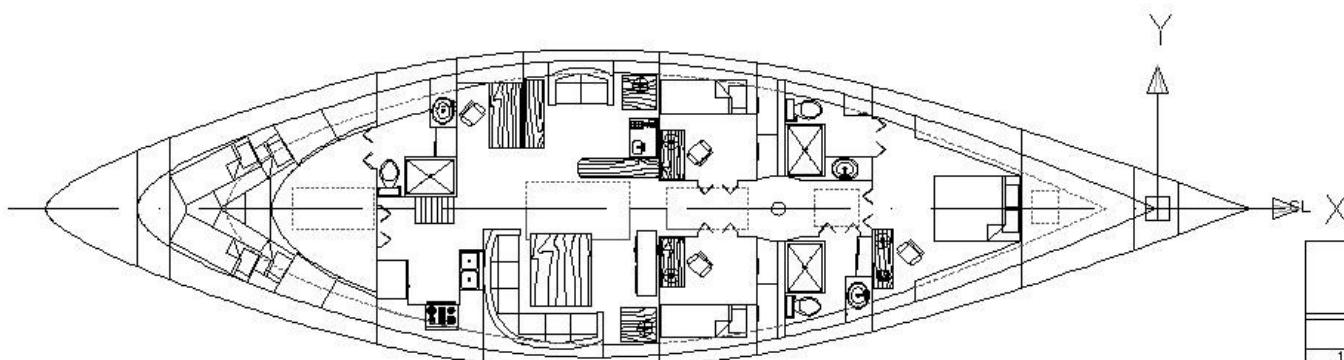
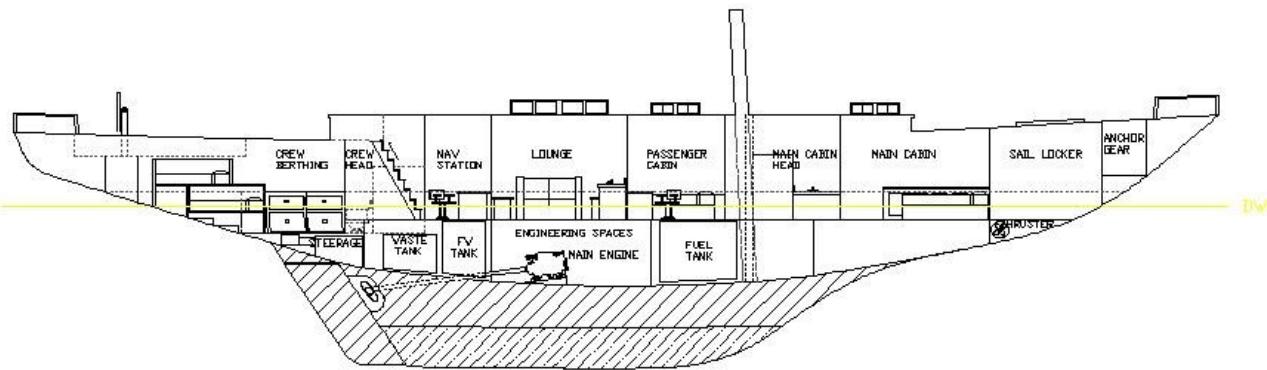
Sail Area/Rudder Area: 0.72

Stall angle: 10 degrees





Accommodations



ISIS GENERAL ARRANGEMENTS	
DESIGN TEAM	
1/C WEBER	
1/C JOHNSON	
1/C SAMMATARO	
1/C DOHERTY	
DRAWING 1 OF 1	DATE: 26 APR 05
REVISION 16	SCALE:
COMMENTS:	

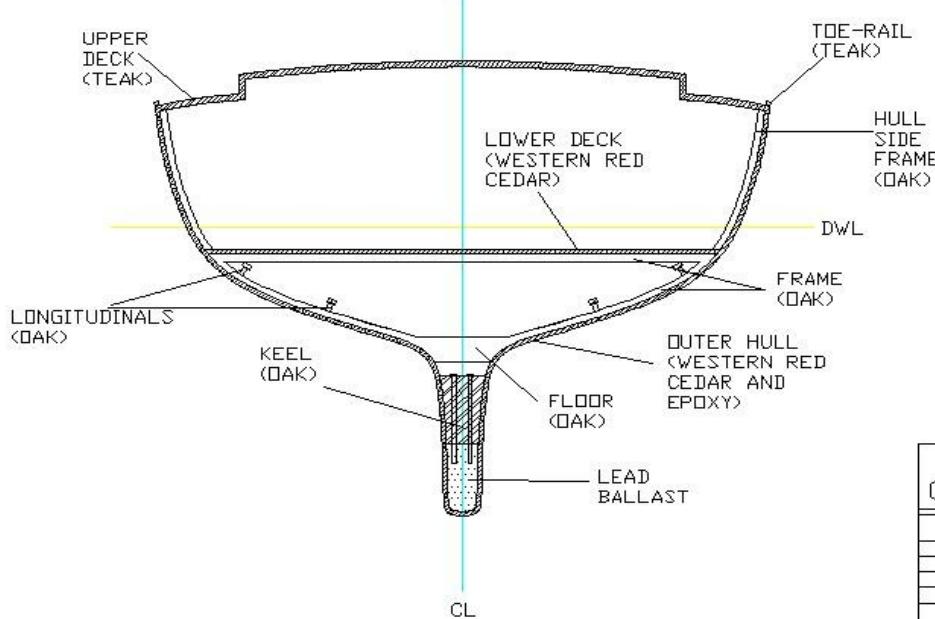


Structures

- Cold Molded Wood and Epoxy Construction
 - Thickness – 0.20 in. (ABS Rules)
 - Width – 4.89 in. (ABS Rules)
- Lead Keel
 - Keel Bolt Diameter – 1.91 in. (ABS Rules)



Midship Construction Section



ISIS MIDSHIP CONSTRUCTION SECTION	
DESIGN TEAM	
1/C WEBER	
1/C JOHNSON	
1/C SAMMATARO	
1/C DOHERTY	
DRAWING: 1 OF 1	DATE: 26 APR 05
REVISION: 8	SCALE:
COMMENTS:	



Weights and Centers

Lightship: Displacement – 86.8 LT

VCG – 10.3 ft (+baseline)

Full Load: Displacement – 95.7 LT

VCG – 10.3 ft (+baseline)

Fuel Capacity – 1400 gallons

Water Capacity – 900 gallons

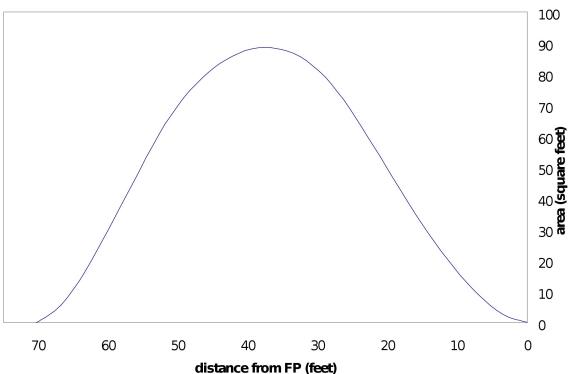
Burnt Out: Displacement – 87.9 LT

VCG – 10.4 ft (+baseline)



Hydrostatics

Section Area Curve



Disp: 95.7 LT

LCB = 37.05
ft

LCF = 37.5 ft

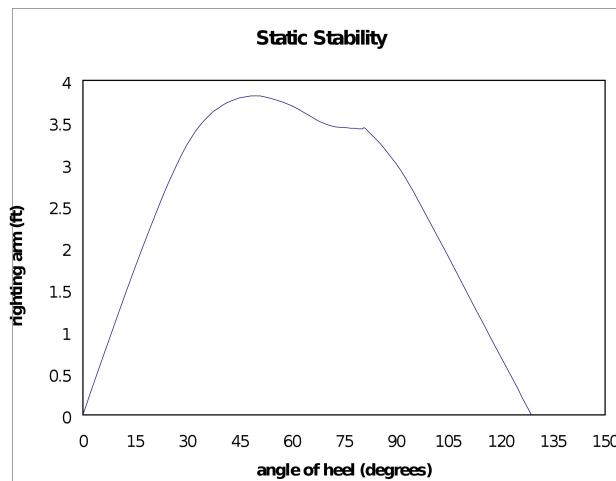
WSA: 1548 ft²

$C_B = 0.40$

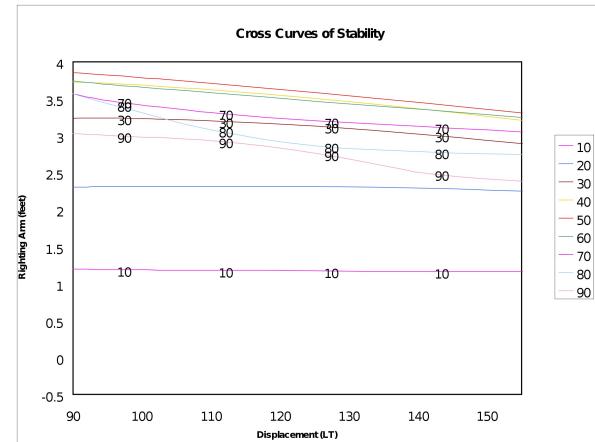
$C_P = 0.54$

LPS = 129°

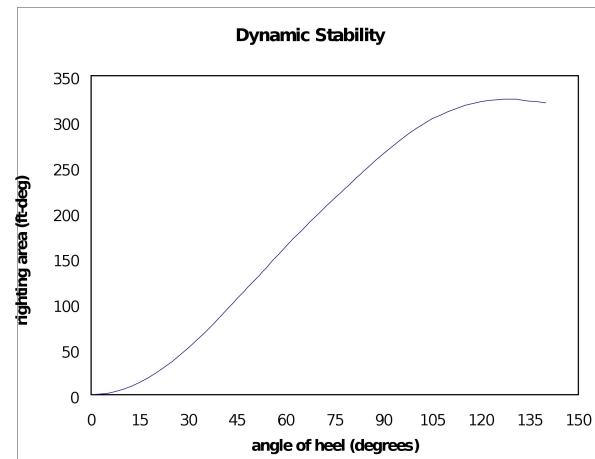
Static Stability



Cross Curves of Stability

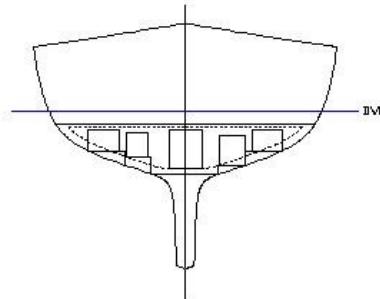
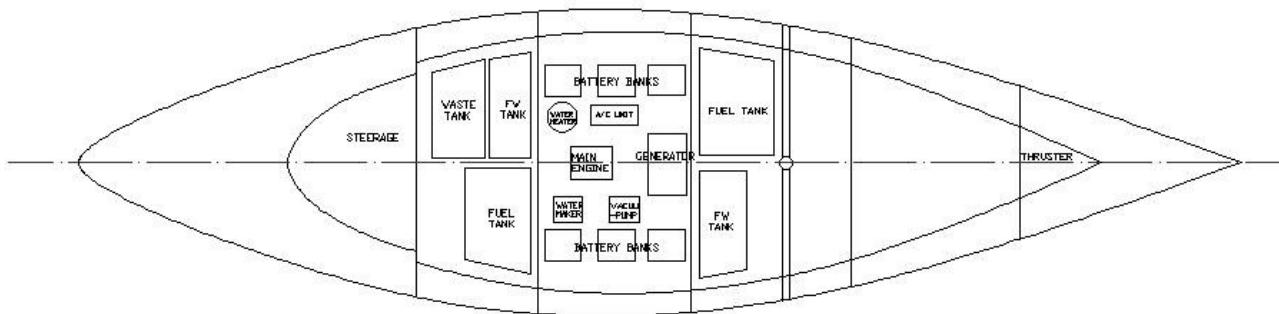


Dynamic Stability





Engineering Diagram



ISIS ENGINEERING ARRANGEMENTS

DESIGN TEAM

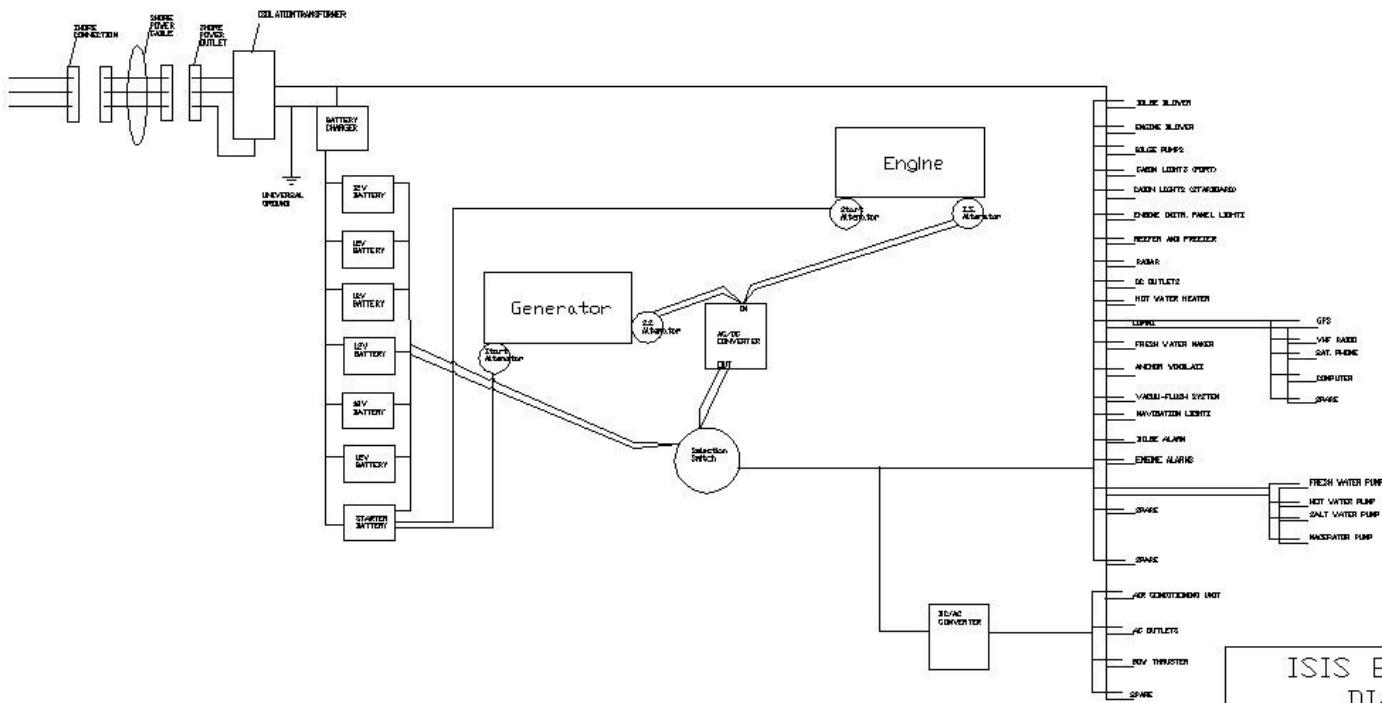
I/C WEBER	
I/C JOHNSON	
I/C SAMMATARO	
I/C DOHERTY	

DRAWING: 1 OF 1 DATE: 27 APR 05

REVISION: 6 SCALE:

COMMENTS:

Electrical Diagram



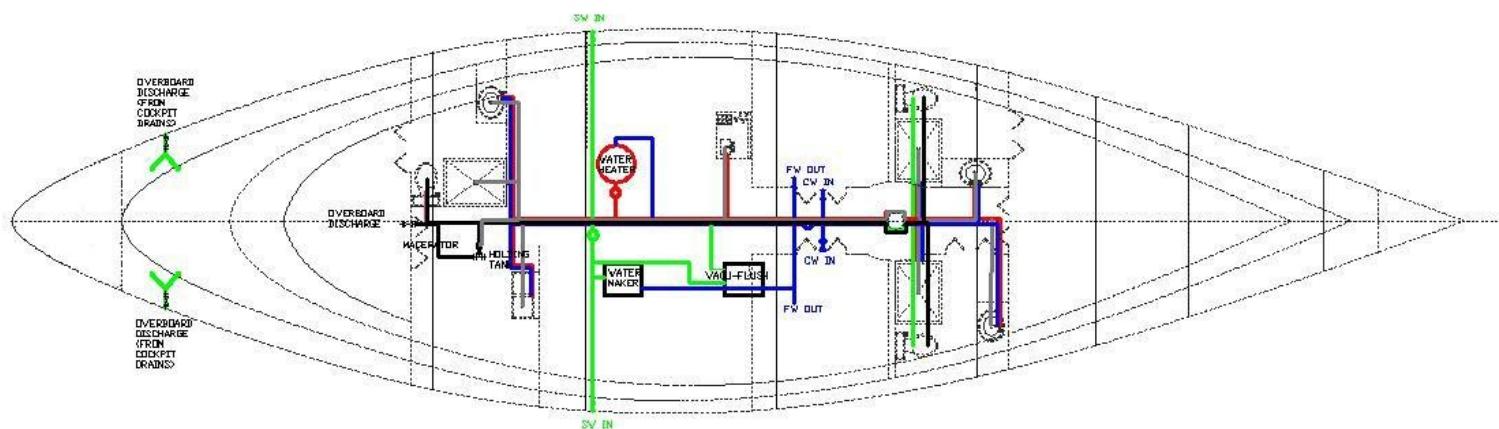
ISIS ELECTRICAL
DIAGRAM

DESIGN TEAM

1/C WEBER	
1/C JOHNSON	
1/C SAMMATARO	
1/C DOHERTY	
DRAWING: 1 OF 1	DATE: 26 APR 05
REVISION: 5	SCALE: NTS
COMMENTS:	



Piping Diagram



ISIS PIPING
DIAGRAM

DESIGN TEAM

I/C WEBER

I/C JOHNSON

I/C SAMMATARO

I/C DOHERTY

DRAWING: 1 OF 1 DATE: 26 APR 05

REVISION: 2 SCALE:

COMMENTS:



[Powering

Yanmar Type 4JH3-THE Diesel Engine



- 100 hp at shaft
- 3800 RPM at shaft
- 92 hp/3700 RPM continuous rating output



Powering

Onan 35 kW/60 Hz Diesel Generator

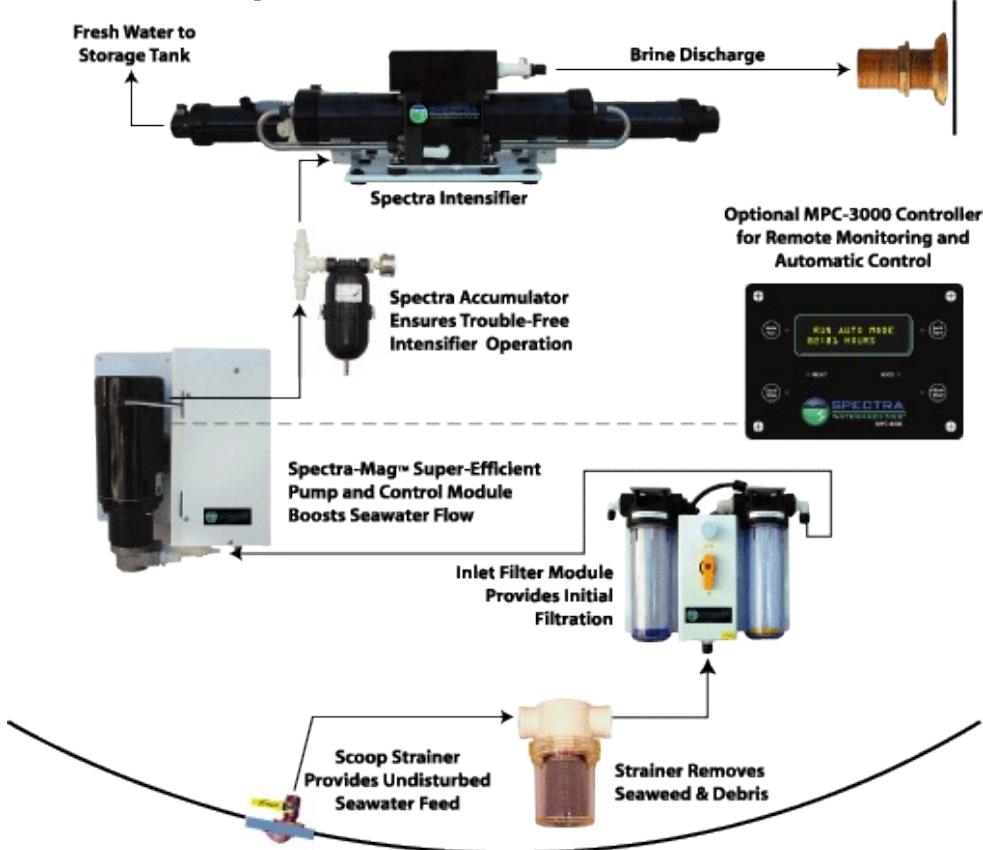


- 35 kW
- 120 V
- 121 A
- 3 Phase
- 60 Hz
- 1800 RPM



Auxiliary Machinery

Spectra Catalina 300 Water-maker



Water Production:
300 gal/day
12.5 gal/hr



Auxiliary Machinery

Seaward Products H2850 Water Heater



Capacity: 28 gallons



Auxiliary Machinery

Marine Air CS 16000 Air Conditioner



Capacity: 16,000
BTU/hr



Acknowledgements

- The *Isis* Design Team thanks the following people for their time and effort on our behalf:
 - Prof. Miller
 - LT. Almeida
 - Mr. Tom Price

QUESTIONS???

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